AN ACCOUNT

OF

THE REASONING PROCESS,

BY

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"I EXPRESS MYSELF WITH CAUTION, LEST I SHOULD BE MISTAKEN TO VILIFY REASON; WHICH IS, INDEED, THE ONLY FACULTY WE HAVE WHEREWITH TO JUDGE CONCERNING ANY THING."—*Butler's Analogy.*

WASHINGTON:
GIDEON & CO., PRINTERS.
1850.

AN ACCOUNT OF THE REASONING PROCESS.

(1.) Every human being, in whatever condition he may be placed, or in whatever occupation or pursuit he may be engaged, is constantly urged to the exercise of Reason, for the purpose of finding out rules of conduct, or the laws of nature relating to the subjects about which his thoughts are employed.

(2.) This act, properly called the Reasoning Process, is a function of the mind, as the circulation of the blood, digestion, &c., are functions of the body, and is the characteristic that distinguishes the human mind from that of brutes.* It is the means bestowed by the Author of nature on man, by which he is enabled to acquire the knowledge that may be useful to him for the various purposes of life.

(3.) Science, properly so called, is conversant only about rules or laws and may be separated into two grand divisions. The one including the Physical or Natural Sciences, which relate to the laws of nature, or the laws which, in all the changes constantly taking place in the world around us, are invariably observed. The other division, comprehending all other sciences.

(4.) In the former division, the rules or laws are fixed and established by the Creator. To these there are no exceptions. A single clear and unequivocal exception to any proposition assumed to be a law of nature, is a complete refutation of such proposition.

In the latter division of the sciences, rules or laws may be laid down as the result of generalization, to which many exceptions may be found, without at all invalidating these rules.

(5.) The functions of the body—digestion, the circulation of the blood, &c., are performed by means of several organs. To understand the nor-

* This remark requires some qualification. There are two distinct modes of reasoning. In the one, laws are traced out so that they may be expressed in words, or recorded in writing; to knowledge thus acquired I propose to limit the term Science. It is this kind of reasoning that is characteristic of the human intellect. But there is an imperfect kind of reasoning wherein a knowledge of laws is attained, vague, it is true, and indistinct, yet sufficiently defined to influence actions. To knowledge arrived at in this way, we think it advisable to confine the term Experience. Brutes seem to be capable of this mode of reasoning to a certain extent.

mal state of these functions, or to correct the derangement of them, it is necessary to attend to the action of the organs concerned in such functions. The mental function or Process of Reasoning, is, in like manner, the result of the exercise of several of the organs or faculties of the mind; and to correct the defects or faults to which it is liable, it is equally necessary to look to the exercise of these faculties. A true account, then, pointing out the particular faculties engaged in this process, must be a subject of the greatest interest.

(6.) In every legitimate act of Reasoning, there must be the exercise of three of the faculties of the mind—Observation, Imagination, and Judgment—and the exercise of these faculties must take place in the order in which they are here enumerated.

The province of Observation is the notice or apprehension, as logicians say, of particulars or instances. The exercise of the Imagination consists in casting about, as it were, for the purpose of finding some proposition or hypothesis, that may be applicable to the instance observed. The Judgment is then called on to decide, if the proposition found by the Imagination be applicable to the particular instance; if all the circumstances attending be fully and satisfactorily explained; and, finally, it must appear to the Judgment that the hypothesis is applicable in like manner to other similar instances.

(7.) The distinction I have made, among the objects of science, will be found to be of great practical importance, and must be constantly borne in mind, if we would avoid confusion of thought, or the most erroneous conclusions. From a neglect of this precaution, many rules or laws have been admitted into the physical sciences, having no general application, and consequently leading to conclusions, palpably erroneous or ridiculously absurd. In the other sciences, a neglect of this same precaution gives rise to all the baneful effects resulting from Fanaticism. In politics, ethics, &c., wherein exceptions to the rules or laws which constitute the science, are not only allowable but must be admitted, the Fanatic madly insists on giving such rules or laws, the force and authority of laws of nature. He will listen to nothing that appears to be an exception to his rules.

(8.) The plain and simple account, given above, of the Process of Reasoning, I will presently endeavor to illustrate, by shewing its operation in the discovery of a law of nature. We will first, however, point out what appear to us to be the defects in the accounts of this process, which have been given by others.

(9.) Two systems or methods of Reasoning have been proposed. One by Aristotle, called the Aristotelian or Syllogistic method; the other by Lord Bacon, called the Baconian or Inductive method. What appears to

us to be very remarkable about these systems is, that although each of their authors professed to give an account of the same process, and although these two accounts differ from one another in toto, yet it is generally admitted, that they do not clash with, or contradict each other. "Bacon's Organon," it is said, "is not intended to supersede that of Aristotle."

The only way that occurs to us, by which this apparent contradiction can be explained, or this discrepancy reconciled, is to suppose that which, in my opinion, is true, viz., that each of these writers gave an account of a part only, and that each selected a different and distinct part, of the process; the Syllogistic method having reference only to what we have stated to be the third part, that in which the Judgment is concerned; the Inductive method having reference only to the first part, wherein Observation is exercised.

(10.) It is generally objected to the Syllogistic method, that it is useless as a means of discovering new truths. One of the ablest advocates of this system, of the present day, in endeavoring to do away the force of this objection, is compelled to take the strange position that Reasoning is not intended as a means of discovering any new truth, but that its object is "merely to expand and unfold the assertions wrapt up, as it were, and implied in those with which we set out, and to bring a person to perceive and acknowledge the full force of that which he has admitted; to contemplate it in various points of view, to admit in one shape what he has already admitted in another, and to give up and disallow whatever is inconsistent with it."

(11.) The view thus taken by Bishop Whately of the object of reasoning, and the admission, that the Syllogistic method accomplishes merely this object, confirm the opinion I have expressed that it relates only to the latter part of the process; for, it is evident, that what he has represented to be the whole process, should properly be regarded as the work of the Judgment alone.

(12.) What it was that Lord Bacon intended when he proposed the Inductive method, or what particular method he had in view, it is not easy to say. He has not only failed to give an intelligible account of it, but he seems, in his writings, studiously to avoid leaving any trace or clue by which his meaning could be ascertained. He gives us to understand, indeed, that he had discovered a rule, by means of which, any person, of ordinary powers of intellect, could, with certainty and in a short space of time, find out a new scientific truth, which could not be arrived at without the use of this rule; at least not without hard and laborious study, and that continued for a length of time. Yet neither he, nor any one since his time,

has, by means of any rule laid down by him, or which could fairly be inferred from his writings, discovered any such truth.

(13.) The author of this system, in the course of his work, deludes us with the promise of giving an example* that might make his meaning, in relation to his rule, understood; but breaks off in the middle of the example, without having come to any conclusion whatever; and tells us that he does this lest his rule may be disclosed, which, for the present at least, he intends to keep a secret. This secret has never yet been divulged. That a system, such as this, should have enchained the attention of men of learning, throughout the seventeenth, eighteenth, and half of the nineteenth century, would appear to be one of the most remarkable phenomena to be observed in the history of the human mind, during that time.

(14.) The explanation of this phenomenon is to be sought in various circumstances, one of which is well presented by Bishop Whately, in a remark which he applied to a different subject: "I am convinced, says he, that a verbose, mystical, and partially obscure way of writing on such a subject, is the most likely to catch the attention of the multitude. The generality verify the observation of Tacitus: "Omne ignotum, pro mirifico." Another circumstance is, that the author professed to write in such a manner as to select his readers, and to exclude those who were incom-

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* "Let the effect to be produced be whiteness; let the first direction be, that if air and water be intermingled, or broken in small portion together, whiteness will ensue; as in snow, in the breaking of the waves of the sea and rivers, and the like. This direction is certain but very particular, and restrained, being tied but to air and water. Let the second direction be, that if the air be mingled, as before, with any transparent body, such nevertheless as is uncolored, and more grossly transparent than air itself, that then, &c., as glass or crystal being beaten to fine powder, by the interposition of air becometh white; the white of an egg being clear in itself, receiving air by agitation becometh white, receiving air by concoction becometh white; here you are freed from water and advanced to a clear body, and still tied to air. Let the third direction exclude or remove the restraint of an uncolored body, as in amber, sapphires, &c., which, beaten to fine powder become, white wine and beer; which brought to froth become white. Let the fourth direction exclude the restraint of a body more grossly transparent than air, as in flame, being a body compounded between air and a finer substance than air; which flame, if it were not for the smoke, which is the third substance that incorporateth itself and dieth, the flame would be more perfect white. In all these four directions air still beareth a part. Let the fifth direction then be, that if any bodies, both transparent but in an unequal degree, be mingled as before, whiteness will follow; as oil or water beaten to an ointment, though by settling the air which gathereth in the agitation be evaporate, yet remaineth white, though not so perfect. Now are you freed from air, but still you are tied to transparent bodies. To ascend farther by scale I do forbear, partly because it would draw on the example to an over-great length, but chiefly because it would disclose that which in this work I determine to reserve."—*Bacon's Interpretation of Nature*, ch. 12.

petent to judge of his undertaking. Every one preferring to embrace the system, right or wrong, rather than incur the imputation of being incompetent to understand it. But the principal circumstance in which the explanation of this phenomenon is to be found is, that this Baconian system really contained a most important truth; this truth, although occupying a subordinate position in the system, and, although it was regarded by its author as of secondary consideration, yet was the main support that has sustained it so long.

(15.) Lord Bacon, in proposing this inductive method, constantly points out, and forcibly presents to the mind, the necessity of attending to particulars. The truth is everywhere inculcated by him that the observation of particulars or instances, is a necessary preliminary in any attempt at the invention of new truths. This had not been attended to, before his time. Imagination had been allowed frequently to usurp the place of observation, and this, very naturally, lead to a habit of reasoning, which ended only, as he expresses it, in "monstrous altercations, or barking questions."

(16.) The Baconian system was calculated to give a better direction to the human mind in its efforts at reasoning. Its author, however, seems to have had but a vague and indefinite notion of this process. He was not aware that the exercise of the imagination was an essential step in it; but, on the contrary, he seizes every occasion to vilify and traduce this faculty, and regards it as the one with which philosophers should have nothing to do. The great merit of this system consists in its having directed attention to the importance of exercising the observation, in every act of reasoning, or, in other words, to the importance of starting out from positive facts, whether originally observed, or taken from books, or from the observation of others.

(17.) That the estimate we have now made of the Baconian philosophy is just, may be shown by a glance at the present condition of the Sciences, which condition is fairly attributable to the influence of this philosophy. The votaries of science, in modern times, are intent only on the observation of particulars, or, as they express it, "on the acquisition of facts." If you converse with a man of science (I speak of the generality of those professing to be such) on any scientific subject, and should happen to make an allusion to a law of nature, he immediately regards you with suspicion; but if you should, unfortunately, state a theory, or an hypothesis, he sets you down at once as a visionary speculatist, or something worse, and will tell you, with much self-complacency, that *he* never theorizes—*he* is concerned only about facts, and is governed solely by experience. He holds theories and hypotheses in utter contempt; for it has never occurred to him that by these, all our knowledge must be acquired.

(18.) The modern astronomer proposes to himself, as the object of his ambition, the discovery of some distant planet, that has heretofore escaped observation; the anatomist seeks diligently for some stray muscular fibres, that have eluded the vigilance of his predecessors, which he may dignify with the name of muscle, and to which he may attach his own name; the zoologist searches for some animal that has never been described; and the botanist wearies himself in looking for some rare plant which has not found a place in any herbarium.

(19.) If any of these attain the object of their ambition, they are considered as having borne off the palm; they are thought to have accomplished the highest purpose for which the human intellect was designed. They are lauded for enlarging the boundaries of science, and in thus being the benefactors of the human race. Their names are handed down to posterity, and become immortalized.

But, to return to our promise to illustrate our view of the Reasoning Process, by showing its operation in discovering a law of nature. For this purpose we will choose one which we have ourselves traced out by this means.

(20.) The first part of the process of Reasoning, I have said, consists in the observation of particulars or instances. The instance I shall select on this occasion is related by naturalists, and is well calculated to arrest attention. I allude to the protrusion of the tongue of the chameleon, when this animal is engaged in seizing its prey. The tongue, when in a quiescent state, or when fully retracted, is about an inch in length. When observed in this state, the end, or what is called the bulbous part, only is visible; but what is remarkable about it is, that the extremity, like that of the trunk of the elephant, is formed into the shape of, and used as a pair of, forceps. The animal, we are told, when about to catch its prey (commonly a fly or some small insect) directs its mouth towards the object, taking aim, as it were; and when within about eight inches, opens its mouth, and suddenly, and with the celerity of lightning, protrudes its tongue, seizes its prey with the forceps of which we have spoken, and then more leisurely draws it into its mouth.

(21.) The anatomical structure of the tongue and of the parts to which it is attached, is shown in the annexed plate, No. I, taken from the illustrated catalogue of the Hunterian Museum, vol. iii, pl. xxx. The os hyoides (*c*) is represented, extending with its rami, as in other animals, from one side of the throat or neck to the other, in the form of a bow. From the middle point of this, another bone, the os linguale (*d*) projects anteriorly; and upon this the tongue is drawn when retracted, like the finger of the glove upon the finger. The central structure of the tongue (*f*) is composed of a

series of fibrous bands, like hoops, extending from one extremity to the other, having their exterior margins connected together by loose cellular tissue, and thus the organ is well adapted for its retraction upon the os linguale. The structure now pointed out may be aptly compared to the bag of a partridge net—the fibrous bands to the hoops, and the cellular tissue to the net which passes over the hoops and connects them together. Two largely developed muscles (*h*) arise, one from each ramus of the os hyoides, and passing on each side of the central structure, are finally distributed to the bulbous part or extremity (*g*.) A large nerve (*i*) accompanies each muscle to supply it with nervous influence, and by its wavy or zigzag course, well reminds us of the fact that this tissue is inelastic, and consequently that all organs or members of an animal capable of sudden or speedy extension, must have a length of nerve corresponding to their capability of extension.

(22.) When we contemplate the protrusion of this organ, we instinctively ask the question, how is this remarkable phenomenon to be explained? The observation of similar instances, or of any number of instances, it is clear, could never furnish an explanation. Something else must be done; a law of nature must be found to which it may be referred, before we can satisfy this inquiry. Here, then, we come to what I have called the second part of the process of Reasoning. This is to call into exercise the imagination, or what Lord Bacon called the anticipation of the mind, in order to form a conjecture or hypothesis that may explain this phenomenon.

(23.) To what law of nature is this extension of the tongue of the chameleon to be referred? Mr. John Hunter taxed his imagination to find out a law that should answer this purpose. Let him have the benefit of his own words: "The first of these (the fibrous rings or hoops) appears to be composed of rings, or something similar, placed obliquely in contrary directions, so as to appear to be two spirals crossing one another. Whether the other or softer substance, (the loose cellular tissue connecting the hoops) has any direction of fibres I could not observe, but I suspect it is muscular. If I am right in my conjecture of this structure, and of its disposition, it will be no difficult thing to show how it may be elongated; for, if these rings are placed transverse, they may be brought so near to one another as to shorten the whole very considerably; and if they allow of being placed almost longitudinally, they must of course lengthen it very considerably, and this position can be easily produced by muscles, which I take the pulpy substance to be."

(24.) The absurdity of this explanation is so manifest, that it would be a waste of time to point it out in detail. Its author, to construct his hy-

pothesis at all, was compelled, by an effort of his imagination, to convert loose cellular tissue into muscles, and to invest the fibrous rings with properties and powers which they could not possess. This hypothesis, however, such as it is, was the result of the exercise of Mr. Hunter's imagination.

(25.) Mr. Houston, another writer on this subject, in the transactions of the Irish academy, rejected Mr. Hunter's explanation as being chimerical, and offered one in its place. He observed two large sized arteries, passing one to each of the lingual muscles, supplying it with blood; and he imagined that the protrusion of the tongue was effected by the injection of these two arteries. This hypothesis, it is true, was not new. Physiologists had applied it for a long time to explain the action of many organs which they imagined to be endowed with a peculiar structure, called the erectile tissue; but this was perhaps the first time it had been applied to the explanation of this particular instance.

(26.) I shall take some future occasion to show the fallacy of this hypothesis whenever applied. It will be a sufficient refutation of it, however, in the present instance, to advert to the fact, that it is utterly impossible to conceive that the blood could be transmitted through its vessels with the velocity necessary to account for the suddenness and celerity with which the organ is said to be elongated.

Having pointed out what I consider objections to the two hypotheses advanced to explain this phenomenon, (and I believe these are all that have been formed,) I proceed to propose a substitute for them.

(27.) In casting about for a proposition, we gain a useful direction by referring to what is already known. It is a law of nature, known to physiologists, that all voluntary motion is effected by means of muscles, or of muscular fibres. This protrusion of the tongue of the chameleon being a voluntary motion, we must necessarily look to the muscles of the organ as being the instruments by which it is effected. There are but two muscles that could be concerned in this act; and these, (the lingual muscles,) from their being largely developed, and from their being so liberally supplied with both nerves and blood-vessels, would seem, indeed, well adapted to such a purpose. But we are met here by a difficulty: it is assumed by physiologists to be a law of nature, *that muscular action consists in contraction.* If this assumption be admitted to be true, the difficulty, we must confess, is insuperable. But whoever has carefully reflected upon the present condition of physiological science, knows, that what is therein admitted is not necessarily true; and they who have traced its history are well aware that the grossest errors have not only been admitted into that science, but that they have frequently remained there, without being called

down, for centuries. The assumption that causes the difficulty, in the present instance, may be an error of this kind.

(28.) If this difficulty be put aside, and if, contrary to the assumption, *that muscular action consists in contraction*, we assume it to be a law of nature, *that the action of a muscle consists in the active elongation or extension of its fibres*, the explanation of the phenomenon we are considering will be easy. The animal determines the nervous fluid, which is admitted to be the cause of muscular action, to the lingual muscles, through the large nerves which accompany them—these muscles thus become actively elongated, and the tongue is protruded to the extent and with the celerity which have been noticed. This, then, is the proposition we have found by the exercise of the imagination, viz., *that muscular action consists in active elongation or extension.*

(29.) The contraction of muscles may readily be explained in accordance with this law. If an animal possesses the power of determining its nervous fluid in one direction, it may determine it in another. If its determination *to a muscle, causes its elongation*, a determination *from the muscle*, either by withdrawing it to the nervous centre, or diverting it into some other channel, *would cause its contraction.*

(30.) Having found a proposition or hypothesis applicable to the instance before us, the work of the imagination is done. That which we have represented to be the second part in the process of Reasoning, is completed, and the third and last part only remains to be attended to. The judgment, we have said, must be called into exercise to decide, if the proposition, found be fairly applicable to the instance in hand, and if all the material circumstances connected with it be fully and satisfactorily explained. The hypothesis I have proposed, is simple, and, I think it will be admitted, fulfils these requirements; whilst those advanced by Mr. Hunter and Mr. Houston are objectionable, not only in not explaining the circumstances, but in being far-fetched and unnatural.

(31.) But it must also appear to the judgment that the proposition, if assumed to be a rule, must be applicable to other similar instances; or, if assumed to be a law of nature, to *all* similar instances. I will proceed to apply this test also to the law proposed. There will be no difficulty in finding instances for this purpose; they are to be met with in every page of physiology, both human and comparative; but not to weary the attention I will select two only, to give in detail.

(32.) Dr. Arthur Farré, in the second part of the Philosophical Transactions for 1837, has given a very interesting description of certain small aquatic animals, which he called Bryooza. These animals are composed

externally of a horny tube or cylinder, open at top; the interior consists, mainly, of its organs of digestion and their appendages. The latter, termed tentacula, are capable of being protruded from the extremity of the horny tube for the purpose of collecting particles of food, or nourishment, from the surrounding medium. Placed at regular intervals around, and conveniently inserted into the tentacula, are muscles or bundles of longitudinal muscular fibres, which arise from the inner and upper surface of the external cylinder.

(33.) The protrusion of the tentacula is what we are at present interested in; and it is curious to notice the hypothesis which Dr. Farré formed to explain it. He observed the muscles of which we have just spoken; that they were well developed, and thought them admirably adapted to the *retraction* of the organs; but was greatly puzzled, at first, on finding no provision made, by nature, for the *protrusion* of them. This must, indeed, have appeared to him singular, inasmuch as the protrusion of the tentacula was confessedly of as much importance in the economy of the animal as their retraction, for which such ample provision had been made. After closely examining a number of specimens, however, he finally detected some few minute fibres running transversely around the stomach of some of them. This fortunate discovery removed all difficulty; the transverse fibres, he thought, when contracted, would necessarily force out the fluid contents of the stomach, and along with them the tentacula!!! It seems strange that such a hypothesis should ever have been seriously entertained; but it is still more strange that another writer, of high standing in his department of science, should have attempted to apply it to other instances.*

(34.) On viewing the annexed plate, No. II, taken from Jones's Animal Kingdom, p. 111, representing the tentacula of Bryozoa in different stages of extension, I think it will at once be understood how the law we have proposed would furnish a satisfactory explanation of the protrusion of these organs. The active elongation of the muscular fibres attached to the tentacula would explain every thing. We will apply this law to another instance.

(35.) The eyes of the snail, it is well known, are situated at the extremity of two soft cylinders, or fleshy tubes, commonly, though improperly, called its horns. Two well defined muscles, separate from the common mass of muscle, by which the voluntary motions of the animal are effected, and passing through the abdominal cavity and that of the fleshy tubes, are inserted immediately around the posterior border of the eyes.

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* Jones's Animal Kingdom, p. 44, § 61.

(36.) The best representation I have met with of the anatomy of this organ, was found in the annexed plate, No. III, taken from the work last quoted, p. 402. The muscles of the eyes (*g*) are there well shown, accompanied each by a large nerve, (*f*, *h*,) which possesses the peculiarity remarked when describing those of the tongue of the chameleon—that is, a length adapted to the extent to which the muscle is capable of being elongated. About the walls of the fleshy tubes, minute muscles, or bundles of muscular fibres, are seen to be arranged circularly. (*e.*)

(37.) If we look at the plate representing this anatomy, we may readily perceive how the animal, by determining the nervous fluid to the muscle, and thus actively elongating it, could *protrude the eye;* and by ceasing such determination, or by withdrawing the fluid, could shorten or contract the muscle, and thus *retract the eye.* We may farther understand, that by calling into action, or elongating, the muscles or fibres about the walls of the tubes, they might be dilated, for the purpose of affording free play to the muscles and nerves passing through them. That such is the purpose for which these muscles were designed we may be convinced, on placing a living snail, when the eye is in full operation, between the light and our eye; when we may see the tube dilated, and the muscle going to the eye, extended, and plainly lying along the floor, as it were, of the tube, but in contact with it only on one of its sides.

(38.) But what hypothesis does Mr. Jones adopt to explain this subject? It is this: "To evert the tentacle (the horn of the snail) the contraction of the circular muscles that form its walls is sufficient, *as they can gradually unrol the whole, by squeezing out, as it were, the inner portion; but to effect its inversion a special retractor muscle is required!!!*"

(39.) A more extensive application of the law of nature, we have suggested, is not consistent with the design of this paper. Any one, by turning over the leaves in a work on comparative anatomy, may find many instances as strikingly illustrative of its truth as those we have given, with explanations, too, as puerile and ridiculous. We may say, however, in this connection, that we have, for more than sixteen years, carefully observed or considered the operation of this law, in every form of muscle, not only in the human subject, but also in all the lower orders, or animals, and that we feel fully justified in asserting that no exception to it can be found. This, we consider, the only true test by which to know if any proposition be a law of nature, and to this test we are willing to submit our hypothesis.

(40.) We have thus given what we believe to be a true account of the process of Reasoning, and shown its application in discovering a law of nature. Happily, however, for mankind, we are not solely dependent,

in our ordinary occupations, or in the common occasions of life, on the rules or laws that have been fairly traced out, or clearly established and laid down in words. So far as this has been done in relation to any subject, thus far is that subject reduced to a science; but reason is often conducted tacitly, as it were, or secretly, and we arrive at conclusions without being conscious that any such operation has taken place in the mind; and what is very curious, the conclusions thus arrived at are, sometimes, not recognised when presented in words, or may even be unhesitatingly rejected. That this secret process does take place, however, may be inferred from the fact, that a knowledge of many of the laws of nature, not otherwise known to them, is fairly implied in the conduct of individuals.

(41.) Innumerable instances might be adduced in confirmation of the truth of this remark, but I will only mention two of them. A knowledge of the law of nature, I have pointed out, is clearly implied in the daily conduct of physicians. Not to mention other instances—when a muscle becomes contracted by spasm or otherwise, friction, or other means of determining the nervous fluid to the muscle, for the purpose, evidently, of elongating its fibres to the normal state, is constantly resorted to. And, on the other hand, when a blood vessel has its calibre increased by the elongation of the fibres about its walls, (in consequence of the determination of the nervous fluid to those fibres,) as in active inflammation, the physician invariably makes use of every means in his power to lessen that determination of the fluid, by what is called the antiphlogistic regimen, or to withdraw it or divert it into some other direction by means of revulsives. Again:

(42.) Although it has been known to some men of science, and has even been formally laid down in the books, "that a law of nature has no exceptions," yet the generality have paid no attention to this truth, nor have they, knowingly, applied it to any practical purpose. It is to them, then, as if it had never been known. When I have presented to such persons, as I frequently have done, the law, "that muscular action consists in active elongation," they instantly reject it, because they readily find—what appears to them to be—exceptions to it. When we bend our arm, say they, do we not know that the flexor muscles are in action; and are they not contracted? When a muscle is pricked or pinched, is it not stimulated into action, and is it not contracted? "So they turn away in a rage." They do not stop to reflect, that in the former instance, by an effort of the will, the nervous fluid may have been *withdrawn from the flexor muscles, and then their contraction be a passive state;* and in the latter instance, that the violent impression made upon the muscle may have ex-

cited into action its corresponding nervous centre, and thus the nervous fluid, or cause of action, may have been determined *from the muscle* towards the centre, instead of *from the centre* to the muscle. Nor do they stop to consider, that it is more rational to attribute the contraction of muscles to a *withdrawal from them*, than to *a determination to them* of the nervous fluid.

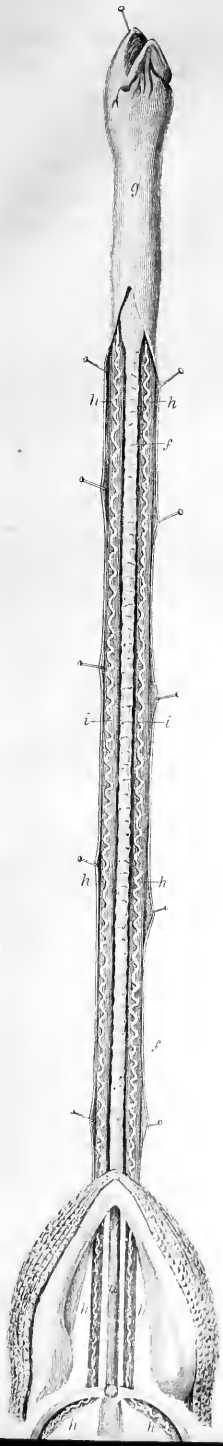
(43.) A facility in carrying on this secret process of reasoning, is what should be understood by the expression *common sense.* Any one possessing common sense, and using moderate application, who is conversant about any particular subject, soon acquires a knowledge of many rules or laws relating to that subject, which are not contained in the books, or which he could not otherwise arrive at. Yet, such person might not be able to state, in words, a single law or rule that he had so acquired; nay, he might even reject them if they were so stated. We may place confidence in a physician known to possess common sense, and who has had much experience in his profession, notwithstanding we may be certain that he is not aware of, or would reject if presented to him, what we know to be important fundamental principles in the science of medicine. This secret reasoning, or the act of inferring or deducing rules or laws *secretly*, from facts relating to subjects with which we are familiar, would be a very appropriate meaning to attach to the word *experience;* that is, *a finding out* laws or rules; and one who passes through life, and from indolence or incompetency, should fail to deduce laws from the facts connected with such subjects, might with propriety be said, "to have grown grey without the benefit of experience."

(44.) A reference to the process of which we are speaking, explains the origin of the opinion of one of the ancient philosophers, "that all knowledge is but remembrance," and explains too, how it is, that in some instances, when a new truth is presented to our minds, we seem to have known it already; we recognise it as an old acquaintance.

(45.) But, it may be asked, if we can thus unconsciously reason out rules or laws sufficient to direct us in our conduct, where is the advantage of tracing them out with so much study and labor? What advantage has science over experience? The advantages of science are infinite. We can, by means of this alone, communicate our knowledge to one another. The knowledge that is acquired unconsciously, is applied for the most part partially, or to but few particulars. That that is traced out and recorded, gives to the mind freedom and liberty, as it were, to apply it to any number of instances. The former kind of knowledge enables us, indeed, to grope our way so as to arrive at many desirable results; but the light it affords is dim and flickering, and the mind ever remains vacillating and in

doubt; but a knowledge of rules and laws, fairly traced out and firmly established, removes all uncertainty, and places the mind in a state which is truly represented in the following quotation: "It is a view of delight, to stand or walk upon the shore side, and to see a ship tossed with tempest upon the sea; or to be in a fortified tower, and to see two battles join upon a plane; but it is a pleasure incomparable, for the mind of man to be settled, landed, and fortified in the certainty of truth, and from thence to to descry and behold the errors, perturbations, labors, and wanderings up and down of other men."

I



II

III